

THE MINERAL INDUSTRY OF

POLAND

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In 1997, Poland was the second largest producer of copper in Europe and Central Eurasia and ranked among the top 10 world producers of copper in terms of mine output and refined metal production (U.S. Geological Survey, 1998, p. 52-53). Poland also was among the world's major producers of silver and sulfur. The country was one of the region's largest mine producers of lead and zinc, as well as a leading European and Central Eurasian producer of lime, nitrogen (in ammonia), and salt (U.S. Geological Survey, 1997). With respect to mineral fuels, the country remained a major producer of bituminous coal, accounting for about 4% of world output in 1996.

In 1997, Poland's economy remained robust. According to the latest data, the gross domestic product in 1997 grew at a rate of 6.9% compared with that of 1996. Also, the total value of industrial production rose by 9.7% compared with that of 1996. The aggregated values of output of nonfuel mining and quarrying remained at approximately the level of output of 1996. The value of the combined mine output of bituminous coal, lignite, and peat also remained at the 1996 production level. Sales by the nonfuel mining and quarrying sector, however, declined by 1.3%, and those of bituminous coal, lignite, and peat production, by 2.7% despite the overall increase of 2.7% in the total value of sales by industry in 1997 compared with those of 1996. (Główny Urząd Statystyczny, 1997, p. 20, 31, and 119-121).

Major activities in the minerals industry in 1997 included the privatization of Kombinat Gorniczo Hutniczy Miedzi Polska Miedz S.A. (KGHM), Poland's producer of mined copper and refined copper metal, and further foreign investment in the country's cement sector.

Poland's sole producer of primary aluminum was the Huta Aluminium "Konin" S.A. smelter at Konin. The plant produced three grades of primary metal from imported alumina. Konin's current capacity was rated to be in excess of 52,000 metric tons (t) (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 11-16). Although Konin's overall modernization program had fallen significantly behind schedule, the upgrading of the company's environmental technology was sufficient to have removed the facility from Poland's list of industrial polluters (Ministry of Environmental Protection, Natural Resources, and Forestry, 1998, p. 12). In addition to primary aluminum produced at Konin, secondary aluminum, as ingots, was produced at Zakłady Metali Lekkich "Kety" SA, Zakłady Metalurgiczne "Skawina," and Zakłady Metalurgiczne "Trzebinia."

Poland was second only to Russia as the largest mine producer of copper in the European and the Central Eurasian regions. In terms of world output in 1997, Poland ranked among the top 10 copper-producing countries (U.S. Geological Survey, 1998, p. 52-

53). The production of electrolytically refined copper, the dominant component in the country's refined copper production, increased by 3.8% compared with that of 1996 (Główny Urząd Statystyczny, 1998, p. 125). Exports of unwrought copper and copper alloys in 1996 amounted to 208,500 t (apparently included refined copper scrap), an increase of almost 3% compared with those of 1995. Exports of wrought copper and copper alloys, however, fell short of the export level of 1995 by about 6% (Główny Urząd Statystyczny, 1996, p. 136; 1997, p. 196). In 1996, France, Germany, and the United Kingdom were the principal recipients of refined copper, receiving 45,500, 29,400, and 87,800 t, respectively (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 131-144).

In early 1997, the Government of Poland indicated that the privatization of KGHM was to begin in June, with the estimated value of the tendered shares to amount to be more than US\$500 million (Mining Journal, 1997a). The Government planned to sell and distribute 51% of the company's stock (200 million shares)—36% of the stock (72 million shares) would be sold, and 15% of the stock (30 million shares) would be distributed to employees. The public offering (72 million shares) included 20 million shares for domestic sales, 35 million shares for the international market, 7 million shares to international coordinators in case of overallotment, and 10 million shares for addition to the public offering in case of higher than expected demand. The Government-owned residual would amount to 49% (Mining Journal, 1997b).

KGHM operated three mines (Lubin, Polkowice-Sieroszowice, and Rudna), three smelters and refineries (Glogow I, Glogow II, and Legnica), and the Cedynia rolling mill at Orsk. The total surface area of the three contiguous mines amounted to about 412 square kilometers. The ore deposits are hosted in a sedimentary formation dipping 4 to 5 degrees to the northwest (Lubin-Rudna). The main mining area is in the southwestern part of the country where ore is found in the Kupferschiefer stratum, which extends from Germany. Chalcocite is the principal mineral, but there also are lesser amounts of bornite and chalcopyrite. The mineralization is mainly in the shale strata, although it also extends into the overlying carbonate and underlying sandstone layers (Cifford, 1997). Total reserves as of December 31, 1996, amounted to 2.29 billion metric tons of ore (Gt) containing 44.14 million metric tons (Mt) of copper. The portion of reserves under exploitation in 1997 was composed of 1.73 Gt of ore containing 33.05 Mt of copper (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 133).

The Rudna Mine produces ore with an average copper (Cu) content of 3% (1997). At the work face, the dolomitic top layer has an average content of 3% Cu, the shale layer hosts up to 15%

Cu, and the lower sandstone layer hosts an average 2% Cu (Miroslaw Bilinski, Technical Director, Rudna Mine, KGHM, Polska Miedz S.A., oral commun., September 19, 1997). Selected data for 1996 for the three mines are given in table 2.

With the aim of streamlining operations, KGHM planned to reduce operating costs from US\$1,943 per metric ton of copper in 1997 to \$1,435 per ton copper in 2000. The U.S. investment firm Merrill Lynch & Co., Inc. calculated that wages, raw materials (including energy), and repairs will be 33%, 34%, and 7%, respectively, of total costs (Reuters Limited, 1997a). The company also planned to invest about US\$2.5 billion during a 5-year period to modernize and increase production. KGHM's investment program for 1997 called for an increase in outlays of 27% compared with those of 1996 (US\$200 million compared with US\$157 million in 1996), which included plans for constructing a desulfurization plant at Glogow worth 100 million zlotys (about \$US29 million) (Mining Journal, 1997d).

In 1997, KGHM's international commercial activities included plans to invest US\$54 million in mine development in the Democratic Republic of the Congo (formerly Zaire) to mine cobalt and copper deposits; of this amount, US\$19 million was to be invested in 1997. KGHM was studying investment opportunities in China, India, and a number of other African countries (Reuters Limited, 1997c).

During the year, KGHM initiated exploration work for gold in the Zloty Stok (Golden Slope) area of Jelenia Gora Province. Mine development would be started in 1998, provided the resources in the area prove to be economic (Mining Journal, 1997c).

In 1997, Poland remained a major Central European producer of steel. The production of crude steel amounted to more than 11.5 Mt; finished hot-rolled steel products, more than 9.2 Mt; and steel pipes, more than 500,000 t. Also, production in these categories, compared with that of 1996, increased by about 11%, 9%, and 1%. The recovery in the steel sector was consonant with the continuing growth of Poland's economy (Główny Urząd Statystyczny, 1998).

The latest available foreign trade data (1996) show that imports of iron ore and concentrates amounted to about 9.8 Mt, a decline of about 10% compared with those of 1995. The countries of the former Soviet Union (FSU) continued to be the major sources of feedstock to Poland's steel mills. In 1996, Russia and Ukraine supplied Poland with iron ores and concentrates, including roasted pyrites, valued at US\$153 million and US\$60 million, respectively, or about 77% of the total value of Poland's imports of iron ore and concentrate during the year (Główny Urząd Statystyczny, 1996, 1997); Poland stopped mining iron ore in 1990. The FSU also was Poland's major source of ferroalloys with exports from Russia, Ukraine, and Kazakstan valued at US\$11.7 million, US\$10.1 million, and US\$0.5 million, respectively, or about 47% of the value of total imports (Główny Urząd Statystyczny, 1997). In 1996, Poland's apparent consumption of steel decreased by about 12%, from 11.9 to 10.4 Mt. With the exception of the vanadium-bearing titanomagnetite deposits at Suwalki (Krzemianka and Urdyn deposits), Poland's Ministry of Environmental Protection, Natural Resources and Forestry had removed all the country's sedimentary iron ore deposits from its domestic raw materials register. These deposits

(siderite and limonite at Czestochowa and Leczyca), however, were no longer viewed as economic mineral resources (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 249-262).

Poland's steel industry continued to experience trade difficulties with the European Union (EU), especially in view of the country's planned accession to the EU. The EU's European Commission demanded that Poland's earlier agreement to lower tariffs on steel imports and to restructure the steel industry be carried out. Poland had agreed to implement a reduction of tariffs on steel entering the country from 9% to 6% in 1997 and from 6% to 3% in 1998. This goal was not achieved, however, and Poland and the EU agreed to let the 9% tariff stand for 1997, provided that it is reduced to 3% the following year. There remained some concern on the part of the EU that the 3% goal would not be reached and that this could result in further trade disputes (Smith, 1997).

Trade issues also arose during the year with respect to steel exports from Huta Katowice SA to Thailand. Thai trade officials alleged the dumping of steel on the Thai market by Huta Katowice. In appealing the charges, inter alia, representatives of Huta Katowice pointing out that the steel involved in the allegation, which was claimed to cost US\$500 per ton to produce and which was alleged to have been sold on the Thai market for US\$265, actually represented two different steel products. The value of Huta Katowice's exports to the Thai market in 1996 amounted to US\$40 million (Reuters Limited, 1997b).

In 1997, work continued on reducing the steel industry's open-hearth steelmaking capacity. During the first 6 months, Poland's total open-hearth capacity declined to 9.1% of total steel-producing capacity compared with 10.2% during the same period in 1996. Work in this area in 1997 included the installation of a 25-t electric arc furnace (EAF) and ladle furnace at Huta "Batory" SA, which already operated three 9-t EAF's. Installation of a 100-t EAF also continued at P.P. Huta "Czestochowa," and a 85-t EAF at Huta LW sp z.o.o. (Huta Lucchini-Warszawa) was commissioned. Huta Lucchini-Warszawa already operated five 50-t EAF's (Iron & Steelmaker, 1998). Work continued on raising the steel industry's level of continuous casting, which amounted to 21.3% of total steel production in 1996, a low level relative to other European states. In 1997, Huta Lucchini-Warszawa commissioned a continuous caster and Huta Katowice conducted installation work on its second 1.2 million-metric-ton-per-year (Mt/yr) continuous caster and a 1-Mt/yr unit also was under construction at Huta "Ostrowiec" SA (Iron & Steelmaker, 1998).

Lead and zinc ore was mined at two underground mines in the southeastern part of the country. The Olkusz-Pomorzany Mine, near Olkusz, part of the Boleslaw operation, produced ore grading about 1.2% lead and 3.5% zinc, and the Trzebieonka Mine and concentrator, at Trzebieonka, produced ore grading 1.7% lead and 3.53% zinc (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 276 and 524). About 70,000 metric tons per year (t/yr) of lead and 160,000 t/yr of zinc are produced. In recent years, Switzerland has been the major importer of both metals.

In Poland, four deposits in Lower Silesia compose the country's barium reserve base, which, as of December 31, 1996, was

estimated to be 6.14 Mt of barium sulfate. In recent years, production has come from the Boguszow and the Stanislawow deposits, worked by Kopalnia Barytu "Boguszow" Sp. z.o.o. (the Boguszow Mine). After several years of financial difficulty owing to strong foreign competition, low sales, and growing production costs, the Boguszow Mine filed for bankruptcy in 1997. Barite production amounted to about 6,000 t in 1996, but Poland's consumption was in excess of 10,000 t (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 36).

Salient activities in Poland's cement industry during the year involved the acquisition of 60% of the shares of Cementownia "Groszowice" Sp. z.o.o. by CBR of Belgium, a subsidiary of Heidelberger Zement of Germany. The purchase of Cementonia "Groszowice" from Poland's National Investment Fund was accomplished through CBR's Polish subsidiary cement producer, ZCW Gorazdze (Industrial Minerals, 1997c). In a similar move, CBR had acquired a 60% stake in Zielonogorskie Kopalnie Surowcow Mineralnych earlier in the year to secure 15 quarries and 6 deposits of mostly limestone reserves to provide feedstock to its cement operation in Poland (Industrial Minerals, 1997a).

Additional foreign investment in Poland's cement industry in 1997 involved the purchase 34.3% of the shares in Cementownia Chelm SA (Chelm) by Rugby Group PLC of the United Kingdom (Rugby). Rugby also received the option to increase its holdings in Chelm to 75% during the subsequent 3 years. The initial purchase of stock was valued at US\$24.8 million. Chelm, in the southeastern part of the country near Lublin, used four wet kilns and has the capacity to produce 2 Mt/yr of cement. A new dry process production line, valued US\$ 58 million, with a capacity of 1.6 Mt/yr of cement was scheduled for completion in mid-1999 (Industrial Minerals, 1997e).

Bentonite deposits are rare in Poland. Most deposits pertain to sub-bentonites or bentonite clays that contain lesser amounts of montmorillonite. These deposits occur in the Carpathian Mountains, the Carpathian Foredeep strata, the Upper Silesian Coal Basin, and Lower Silesia (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 47-52). Montmorillonite clays occur with hard coal deposits in coal mines at Sosnowiec-Milowice and at Bytom-Radzionkow in the Upper Silesian Coal Basin. In Lower Silesia, bentonite was discovered in the weathered cover of basalts. Bentonite shales occur in the Carpathian Mountains in Trepcza and in slates at the Polany deposit near Gorlice. Bentonite clays also are found in the northern part of the Carpathian Foredeep strata in the Gorki and the Jawor deposits, near Chmielnik. Montmorillonite clays were produced by the Saturn hard coal mine in Upper Silesia until 1992. In 1997, bentonite was produced entirely from the Krzeniow bentonite deposit in Wikow, worked by the "Bazalt" Mining and Production Plant. Production at this deposit began in 1991.

Kaolinite, a two-layer hydrous aluminum silicate, is the chief mineral found in kaolin. Also known as "china clay," kaolin has a wide range of applications that include the manufacture of paper, paint, rubber, plastics, and ceramics. In Poland, deposits of kaolin occur in the Strzegom-Sobotka and the Strzelin-Otmuchow granitic massifs in Lower Silesia. The chief producer of kaolin in Poland is KSM "Surmin-Kaolin" S.A., working the

Maria III deposit in the Nowogrodiec region (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 267-273). To meet the country's rising domestic demand, the production of washed kaolin has been rising steadily from about 42,000 t in 1992 to more than 70,000 t in 1996 (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 269).

Fire or refractory clay, a "detrital material, either plastic or rocklike, containing low percentages of iron oxide, lime, magnesia, and alkalis" can withstand temperatures in excess of 1,500° C (U.S. Bureau of Mines, 1980, p. 184-185)." These clays are fabricated into refractory brick and block, as well as other high-temperature products. In Poland, deposits of fire clays are found in Lower Silesia and in the northeastern part of the Swietokrzyskie Mountains. The Jaroszow fire clay deposits in the Strzegom area of Lower Silesia are Poland's main fire clay resources. The Rusko-Jaroszow deposit is the principal source of material in this area and the only one under exploitation in 1997. The deposit was worked by the JARO Refractory Materials Mining and Processing Plants Joint Stock Co. of Jaroszow (JARO). The company accounted for about 85% (1996) of total fire clay production in Poland (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 111). In 1997, JARO began to produce a new chamotte aggregate, which was divided into three grades. The material was to be sold to cement, glass, electric-power-generation, and metals-producing industries (Industrial Minerals, 1997d).

The Badger Mining Corp. of the United States constructed a new plant for processing high-grade industrial silica in the Tomaszow Mazowiecki area. The new plant, Badger Mining Poland Sp. z.o.o., was 100% owned and operated by Badger. The plant's rated capacity was 200,000 t/yr of silica. The feedstock came entirely from a nearby deposit mined by Zero Trans with whom Badger signed a supply agreement (Industrial Minerals, 1997b).

Poland remained a major world producer of bituminous coal, with most production centered in the Upper Silesian Coal Basin. Significantly lesser amounts of coal also were produced in the Lower Silesia and the Lublin Coal Basins.

The Upper Silesian Coal Basin consisted of 104 deposits with reserves amounting to about 49,476 Mt. In 1995, 59 underground mines were reported as being operational. These deposits contain mainly bituminous and sub-bituminous steam coal; coking coal and anthracite also are mined. Low-quality coal [low calorific value, high ash (20%) and sulfur (2%) content] was mined in the eastern part of the basin, but this product was of lesser marketability. The western and northern parts of the basin contain coal of high average calorific value [6300 kilocalories per kilogram (kcal/kg)] low average moisture (3.8%) with low average sulfur (1.3%) and ash values (13%) (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239). The Upper Silesian Coal Basin accounted for more than 97% of the country's total hard coal output. In March 1993, 49 mines in the Upper Silesian Coal Basin were organized into six coal companies as part of the restructuring process of the coal industry.

The Lower Silesian Coal Basin was almost exhausted. Potentially exploitable resources amounted to 151 Mt as of

December 31, 1996. "Reserves" have been determined to be 4.7 Mt. The complex conditions and depletion of reserves have resulted in the decision to close most coal mining operations in the basin. Owing to exploitable deposits of coking coal and anthracite in the basin, however, sections of the Chrobry and the Victoria deposits were combined to form the Walbrzych-Gaj anthracite deposit in 1992. Commercially exploitable resources at this deposit amount to about 42.4 Mt, which included 20.9 Mt of reserves (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239).

The Lublin Coal Basin, in the easternmost coal mining region of Poland, had 12 deposits; as of December 31, 1996, total exploitable resources amounted to 8,710 Mt, mostly steam coal. Owing to complex geologic and difficult mining conditions, only 332 Mt was classified as exploitable reserves. Calorific values of coal from the Lublin Coal Basin range from 4,100 to 7,500 kcal/kg, with an average value of 6,200 kcal/kg. The ash and sulfur contained in the coal amounted to 21.4% and 1.09%, respectively (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239).

Because of their developed infrastructures and operations, and abundant mineral resources, Poland's coal, copper, lead and zinc, and sulfur mining industries should be able to continue operations into the foreseeable future. The need for newer, more expanded commercial infrastructure should continue to stimulate the growth of the country's industrial minerals sector for the production of cement, construction materials, and steel.

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TABLE 1
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/ METALS	1993	1994	1995	1996	1997
Aluminum metal, primary	46,942	49,509	55,728	51,900 r/	53,614
Alumina, nonmetallurgical (<30% Al ₂ O ₃) e/	200	--	--	--	-- e/
Cadmium metal, primary	149	61	--	-- r/	22
Copper:					
Ore:					
Gross weight thousand tons	27,113	26,136	26,463	27,427	26,165
Metal content	430,800	423,600	431,100	472,600 r/	464,600
Concentrate:					
Gross weight thousand tons	1,559	1,494	1,507	1,600 r/ e/	1,650 e/
Metal content	382,800	378,200	384,200	421,900 r/	414,800
Metal:					
Smelter:					
Primary e/	396,000	390,000	395,000	410,000	415,500
Secondary e/	16,000	14,000	15,000	4,800	15,000
Total 3/	412,000	404,000	410,000	414,800	430,500
Refined, primary and secondary	404,170	405,093	407,000	425,000	440,600
Gold metal, smelter 3/ kilograms	300	628	510	598 r/	435
Iron and steel:					
Pig iron:					
For foundry use thousand tons	206	204	227	219 r/	263
For steel production do.	5,899	6,662	7,146	6,321 r/	7,032
Total	6,105	6,866	7,373	6,540 r/	7,295
Ferroalloys:					
Ferromanganese	38,400	8,700	18,300	1,100 r/	6,200
Ferrosilicomanganese	27,000	31,800	20,500	25,000	20,000
Ferromanganese:					
From blast furnaces	56,400	66,300	46,300	59,900 r/	47,500
From electric furnaces	1,100	--	--	-- e/	--
Ferrosilicon	43,100	54,200	70,400	71,800 r/	77,300
Other electric furnace ferroalloys	3,000	2,700	3,000	5,800 r/	8,500
Total electric furnace	112,600	97,400	112,200	103,700 r/	112,000
Steel, crude:					
From open hearth furnaces thousand tons	1,660	1,631	1,526	1,118 r/	1,057
From oxygen converters do.	6,162	7,033	7,685	6,757 r/	7,531
From electric furnaces do.	2,115	2,447	2,677	2,554 r/	2,994
Other do.	2	2	2	3 r/	2
Total do.	9,939	11,113	11,890	10,432	11,584
Semimanufactures:					
Hot rolled do.	7,632	8,595	8,998	8,532 r/	9,295
Cold rolled do.	1,401	1,611	1,943	1,788 r/	1,982
Pipe do.	489	503	576	532 r/	538
Lead:					
Pb-Zn ore, gross weight do.	4,819	4,871	5,040	5,034	4,938
Mine output, Pb content of Pb-Zn ore	68,400	72,200 r/	69,000 r/	74,900 r/	68,800
Mine output, Pb content of Cu ore	39,300	28,500	25,000	38,600	39,000
Total Pb mine content	107,700	100,700	94,000	113,500	107,800
Concentrate, gross weight	67,400	80,300	88,300	85,000 e/	85,000 e/
Pb content	49,100 r/	52,600 r/	59,200 r/	59,800 r/	55,600
Metal:					
Smelter:					
Primary	30,400	30,700	34,800	26,400 r/	29,600
Secondary	35,500	35,700	38,600	43,000 r/	43,700
Total	65,900	66,400	73,400	69,400 r/	73,300
Refined	62,300	61,200 r/	66,421	66,000 r/	64,800
Selenium	20	60	73	73	76
Silver, mine output, Ag content, recoverable	767	1,064	1,001	935	1,038
Zinc:					
Mine output, Zn content	182,600	182,800	183,200	186,500 r/	182,900
Concentrate output, Zn content	150,900	151,000	154,500	159,000 r/	158,300
Metal, refined, including secondary	149,107	157,618	166,421	165,000	172,919

See footnotes at end of table.

TABLE 1--Continued
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997	
INDUSTRIAL MINERALS						
Barite:						
Crude	20,400	26,600	22,400	21,700 r/	3,400	
Beneficiated	8,500	9,100	6,100	6,200 r/	1,000 e/	
Cement, hydraulic	thousand tons	12,200	13,834	13,914	13,959 r/	14,910
Clays and clay products, crude:						
Bentonite	9,100	1,100	1,500	1,800	--	
Fuller's earth	4,700	5,200	4,800	6,200	6,100	
Fire clay	thousand tons	316	319	275	248 r/	199
Kaolin:						
Crude	do.	265	294	269	281 r/	262
Beneficiated	do.	48	53	53	72 r/	84
Diamond, synthetic	thousand carats	98	270	256	206 r/	35
Diatomite	1,500	2,900 r/	2,200	1,700 r/	1,200	
Feldspar:						
Run of mine	43,000	46,000	46,000	64,000 r/	75,700	
Beneficiated	32,900 r/	41,400 r/	44,100 r/	58,300 r/	75,700	
Gypsum and anhydrite, crude 5/	thousand tons	832	1,055	1,023	991 r/	1,035
Lime, hydrated and quicklime	do.	2,584	2,516	2,526	2,363 r/	2,516
Magnesite:						
Ore, crude	do.	34,000	30,000	26,000	21,000 r/	30,000
Concentrate	do.	13,000	16,400	21,500	19,300 r/	6,400
Calcined	1,400	1,500	1,200	800 r/	400	
Nitrogen, N content of ammonia	thousand tons	1,163	1,230	1,415	1,405 r/	1,427
Salt:						
Rock	do.	718	750	812	923 r/	791
Other	do.	3,099	3,324	3,402	3,240 r/	3,188
Total	do.	3,817	4,074	4,214	4,163	3,979
Sand, excluding glass sand:						
Foundry sand	do.	669	507	521	1,067 r/	1,034
Filling sand	19,990	18,765	19,067	17,510 r/	14,155	
Lime-sand brick production sand	thousand cubic meters	1,565	1,453	1,435	1,086 r/	799
Silica:						
Quartz and quartz crystal	55,600	39,900	14,200	55,200 r/	77,600	
Quartzite , refractory	128,800	208,000	233,000	294,000 r/	205,000	
Quartz schist	11,500	11,400	8,500	6,500 r/	6,518	
Glass sand	thousand tons	824	759	874	1,111 r/	1,124
Glass:						
Construction, flat	do.	295	266	327	322 r	426
Technical	do.	44	46	48	52 r/	52
Commercial	do.	48	54	64	67 r/	70
Packing	do.	624	712	777	811 r/	873
Sodium compounds, n.e.s.:						
Carbonate (soda ash), 98%	do.	803 r/	979 r/	1,001 r/	893 r/	933
Caustic soda (96% NaOH)	do.	590 r/	591 r/	653 r/	705 r/	718
Stone:						
Dolomite, mine output	do.	4,776 r/	6,409 r/	8,123 r/	7,109 r/	7,086
Limestone, for lime production	do.	11,075	12,230	12,079	12,764 r/	13,136
Limestone for non- lime end use	do.	23,360	26,760	27,036	26,748 r/	28,201
Crushed and dimension stone, mine ou	do.	13,644	16,632 r/	19,780 r/	19,258 r/	21,087
Sulfur:						
Native:						
Frasch	do.	1,861	2,129	2,392	1,733 r/	1,731
Byproduct:						
From metallurgy	do.	210	200	210	200 e/	256
From petroleum	do.	29	34	33	30 e/	44
Total	do.	239	234	243	230 e/	300
From gypsum e/	do.	10	12	12	12	12
Total sulfur e/	do.	2,110	2,375	2,647	1,975 r/	2,043

See footnotes at end of table.

TABLE 1--Continued
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous do.	130,479	133,933	137,166	137,987 r/	137,952
Lignite and brown do.	68,105	66,770	63,547	63,845	63,169
Total do.	198,584	200,703	200,713	201,832	201,121
Coke:					
Coke oven do.	10,275	11,454	11,579	10,340	10,532
Gashouse do.	7	2	--	--	--
Total do.	10,282	11,456	11,579	10,340	10,532
Fuel briquets, all grades do.	102	99	110 r/	96 r/	80
Gas:					
Natural million cubic meters	4,949	4,635	4,803	4,754	4,725
Manufactured:					
Town gas do.	14	15	33	16 r/	10
Coke oven gas do.	4,077	4,840	4,872	4,247 r/	4,414
Generator gas do.	554	399	400 e/	400 e/	400 e/
Total do.	4,645	5,254	5,305	4,663 r/	4,824 e/
Natural gas liquids, e/ thousand 42-gallon barrels	30	30	30	30	30 e/
Peat, fuel and agricultural thousand tons	110	109	199	198 r/	206
Petroleum:					
Crude, as reported do.	235	284	292	317	289
Refinery products 6/ do.	27,169	27,795	28,435	30,000 e/	14,885

e/ Estimated. r/ Revised.

1/ Table includes data available through October 1999.

2/ In addition to the commodities listed above, antimony and germanium, associated with polymetallic deposits, and cobalt and nickel, associated with copper ores, are produced in quantities that so far have not warranted further recovery.

3/ Reported figure.

4/ Based on official Polish estimates.

5/ Includes building gypsum, as well as an estimate for gypsum used in the production of cement.

6/ Includes virtually all major products.

TABLE 2
POLAND: SELECTED DATA ON POLAND'S COPPER MINING INDUSTRY IN 1996

Principal Mines		Rudna	Lubin	Polkowice- Sieroszowice
Mine Production:				
Ore mined	million metric tons	10.39	6.36	9.24
Copper grade	percent	2.08	1.36	1.84
Silver grade	grams per metric ton	49	73	34
Beneficiation				
Plant production:				
Concentrate	thousand metric tons	749	417	487
Copper grade	percent	28.6	18.7	26.7
Copper recovery	percent	89.3	90	88.7
Silver grade	grams per metric ton	629	976	456
Silver recovery	percent	84.4	87.5	82.9
Unit mining cost:				
US\$ per metric ton		0.39	0.47	0.43

Source: Des Clifford, 1997, KGHM Polska Miedz Europe's copper giant: Mining Magazine (Mining Journal, London), August, p. 119.

TABLE 3
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum:			
Primary	Huta Aluminium "Konin" S.A.	Konin	50.
Secondary	Zaklady Metalurgiczne "Skawina"	Skawina	20.
	Zaklady Metali Lekkich SA "Kety"	Kety	
	Zaklady Metalurgiczne "Trzebinia"	Trzebinia	
Barite	Kopalnia Barytu "Buguszow" Sp. Z o.o	Boguszow, Stanislawow	40.
Cement	20 cement plants (in order of size): Gorazdze, Ozarow, Chelm, Warta, Malogoszcz, Nowiny, Strzelce Opolskie, Kujawy, Rudniki, Wierbica, Nowa Huta, Rejowice, Odra, Warszawa, Groszowice, Polcement-Saturn, Wysoka, Cem-Con, Wick, Wejherowo	Primarily in southern Poland. Kujawy, Warszawa, Cem-Con and Wejherowo are in Central and northern Poland.	16,000.
Coal:			
Anthracite	Zaklad Wydobywczzo Przetworczy Antracytu Walbrzych-Gaj	Lower Silesia	200.
Bituminous	Bytomska Spolka Weglowa S.A.	Upper Silesia (9 mines)	140,000.
	Rudzka Spolka Weglowa S.A.	do. (6 mines)	
	Gliwicka Spolka Weglowa S.A.	do. (7 mines)	
	Katowicki Holding Weglowy S.A.	do. (11 mines)	
	Nadwislanska Spolka Weglowa S.A.	do. (8 mines)	
	Rybnicka Spolka Weglowa S.A.	do. (5 mines)	
	Jastrzebska Spolka Weglowa S.A.	do. (6 mines)	
	Seven independent mines	do.	
	Walbrzyskie Kopalnie Wegla Kamiennego	Lower Silesia	
	KWK "Nowa Ruda" KWK "Bogdanka" S.A.	do. do.	
Lignite	KWK "Belchatow"	Belchatow	75,000.
	KWK "Turow"	Turow	
	KWK "Konin"	Konin	
	KWK "Adamow"	Adamow	
	KWK "Sieniawa"	Sieniawa	
Coke	Zaklady Koksownicze im. Powstancow Sl.	Upper Silesia	12,000.
	Zaklady Koksownicze "Przyjazn"	do.	
	Kombinat Koksochemiczny "Zabrze"	do.	
	Huta im. Sendzimira	do. (Krakow)	
	Huta "Czestochowa"	do. (Czestochowa)	
	Zaklady Koksownicze "Walbrzych"	Lower Silesia	
Copper:			
Concentrate, gross weight	Kombinat Gorniczo Hutniczy Miedzi (KGHM) Polska Miedz S.A.	Mines and concentrators at Konrad, Lubin, Polkowice, Rudna, and Sieroszowice	1,900. (385 Cu).
Metal, refined	do.	Refineries at Glogow I, Glogow II, and Legnica	415.
Feldspar	Strzeblowskie Kopalnie Surowcow Mineralnych	Mine at Sobotka, Lower Silesia, workings at Pagorki Zachodnie and Pagorki Wschodnie	50.
Ferroalloys:			
Electric furnace (FeSiMn, FeMn, FeCr, FeSi)	Huta "Laziska"	Upper Silesia at Laziska Gome	170.
Blast furnace (FeMn)	Huta "Pokoj" S.A.	Upper Silesia, Ruda Slaska	90.
Gold (kilograms)	KGHM "Polska Miedz" S.A.	Refinery at Glogow "Trzebinia"	550.
Gypsum and anhydrite	Zaklady Przemyslu Gipsowego "Dolina Nidy"	Southeastern Poland, Gacki	1,400.
	Zaklad Gipsowy "Stawiany"	Southeastern Poland, Szarbkow	
	Kopalnia Anhydrytu "Nowy Lad"	Lower Silesia, Niwnice	
	KGHM "Polska Miedz" S.A.	Lower Silesia, Iwiny	
Helium million cubic meters	Zaklad Odazotowania Gazu	Western Poland, Odolanow	3.

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Kaolin	KSM "Surmin-Kaolin" S.A.	Lower Silesia, Nowogrodziec	50.
Lead-zinc:			
Concentrate	Zakłady Gorniczo-Hutnicze "Boleslaw"	Mines and concentrators at Olkusz and Pomorzany, Bukowno region	60 Pb, 160 Zn.
	Zakłady Gornicze "Trzebiańska" S.A.	Mines and concentrator at Trzebia	
Metal:			
Pb, refined	Huta Cynku "Miasteczko Slaskie"	Refinery at Miasteczko Slaskie	60.
Do.	Huta Metali Niezależnych "Szopienice"	Katowice	35.
Zn, refined	Huta Cynku "Miasteczko Slaskie"	Imperial Smelter at Miasteczko Slaskie	60.
Do.	Zakłady Metalurgiczny "Silesia" (input from Huta "Miasteczko Slaskie")	Refinery at Katowice	(30).
Do.	Zakłady Gorniczo-Hutnicze "Boleslaw"	Refinery at Boleslaw	65.
Do.	Huta Metali Niezależnych "Szopienice"	Katowice	28.
Lime	In order of size:		4,500.
	Zakłady Przemysłu Wapienniczego Trzuskawica	Kieleckie County, Swietokrzyskie Mountains	
	Slaskie Zakłady Przemysłu Wapienniczego Opolwop S.A.	Opole County	
	Zakłady Przemysłu Wapienniczego Bukowa	Kieleckie County, Swietokrzyskie Mountains	
	Kombinat Cementowo-Wapienniczy Kujawy S.A.	Bydgoskie County	
	Zakłady Cementowo-Wapiennicze Gorazdze S.A.	Opole County	
	Zakłady Cementowo-Wapiennicze Nowiny	Kieleckie County	
	Produkcyjno-Handlowo-Uslugowe Wapno-Sabinow	Czestochowa County	
	Wojcieszowskie Zakłady Przemysłu Wapienniczego Sp. z o.o.	Jeleniogorskie County	
	Zakłady Przemysłu Wapienniczego w Sulejowie	Piotrkowskie County	
	Zakład Wapienniczy w Plazie	Katowickie County	
Natural gas (million cubic meters)	Ministry of Mining and Energy	Gasfields at pre-Carpathian foothills Carpathian Mountains Lowlands, near Ostrow Wielkopolski, Poznan, and Trzebnica, north of Wroclaw	4,900.
Nitrogen:			2,400.
Ammonia (NH ₃)	Zakłady Azotowe "Pulawy" S.A. Zakłady Azotowe "Kedzierzyn" S.A. Zakłady Azotowe "Wloclawek" S.A. Zakłady Azotowe S.A. w Tarnowie Zakłady Azotowe S.A. w Chorzowie Zakłady Chemiczne "Police"	Pulawy in eastern Poland Kedzierzyn in Upper Silesia Wloclawek in central Poland Tarnow in southern Poland Chorzow in Upper Silesia Police in northwest Poland	
Fertilizer (N)	do.	do.	1,700.
Petroleum :			
Crude	Polskie Gornictwo Naftowe i Gazownictwo Warszawa	Oilfields in northern and northwestern lowlands; sub-Carpathian region and Carpathian Mountains	200.
Do.	Predsiebiorstwo Poszukiwan i Eksploatacji Rpy i Gazu "Petrobaltic"	Baltic Sea Shelf	100.
Refined	"Petrochimia-Plock" Rafineria "Gdansk" Rafineria "Czechowice" Rafineria "Trzebiańska" Rafineria "Glimar" Gorilice Rafineria "Jedlicze" Podkarpackie Zakłady Rafineryjne w Jasle	Plock in central Poland Gdansk in northern Poland Czechowice in southern Poland Trzebiańska in southern Poland Gorilice in southern Poland Jedlicze in southern Poland Jaslo in southern Poland	13,500.

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Salt, all types	Inowroclawskie Kopalnie Soli S.A.	Gora, Mogilno I, and Mogilno II mines at Inowroclaw in central Poland	6,500.
	Kopalnia Soli "Klodawa"	Klodawa in central Poland	
	Kopalnia Soli "Wieliczka"	Wieliczka in southern Poland, near Krakow, mining deposits at Barycz and Wieliczka	
	Kopalnia Soli "Bochnia"	Southern Poland, mines at the Lezkowice and Siedlec-Moszczonice-Lapczyca deposit. Not known to have operate in 1996	
	KGHM "Polska Miedz" S.A. Kopalnia Wegla Kamiennego "Debiensko"	Sieroszowice in southwestern Poland Debiensko, Upper Silesia	
	Janikowskie Zaklady Sodowe "Janikosoda" S.A.	Janikowo in central Poland	
Selenium	Huta Metali Niezuczynnych 'Szopienice" KGHM "Polska Miedz" S.A.	Katowice Refinery at Glogow	80.
Silver	KGHM "Polska Miedz" S.A. Zaklady Metalurgiczne Trzebinia	Refined from dore produced by the Szopienice Pn-Zn smelter-refinery largely from KGHM supplied slimes	1.
Steel:			14,000 (crude).
Crude and semimanufactures	Huta "Katowice" S.A.	Plant at Dobrowa Gornicza, producing pig iron, crude steel, hot rolled- products, and cast steel	
	P.P. Huta im. T. Sendzimir	Steelworks at Krakow, producing pig iron, crude steel, hot-rolled products, cold-rolled products, pipes, and cast iron	
	P.P. Huta "Zawierciu"	Steelworks at Zawierciu, producing crude steel, hot rolled products, cast iron, and cast steel	
	P.P. Huta "Czestochowa"	Steelworks at Czestochowa, producing pig iron, crude steel, hot rolled sheets, pipes, and cast iron	
	Huta "Ostrowiec" S.A.	Steelworks at Ostrowiec-Swietokrzyski, producing crude steel, hot rolled products	
	P.P. Huta "Labydy"	Steelworks at Gliwice, producing crude steel, and hot-rolled products	
	Huta "Lucchini-Warszawa" Sp. z o.o.	Steelworks in Warsaw, producing crude steel, hot-rolled products, and cold-rolled strip	
	P.P. Huta "Florian"	Steelworks in Swietochlowicach, producing crude steel, hot-rolled products, galvanized sheet, and cold-rolled strip	
	Huta "Stalowa Wola" S.A.	Steelworks at Stalowa Wola, producing crude steel,	
	Huta "Jednosc" S.A.	Steelworks at Siemianowice Slaskie, producing crude steel, hot-rolled products, and pipes	
	Huta "Batory" S.A.	Steelworks at Chorzow, producing crude steel, hot-rolled products, and pipes	
	P.P.Huta "Baildon"	Steelworks in Katowice, producing crude steel, hot-rolled products, cold-rolled strip, and cast steel	
	Huta "Malapanew" S.A.	Steelworks at Ozimek, producing crude steel and cast steel	
	Huta "Zabrze" S.A.	Steelworks at Zabrze, producing crude steel, cast iron, and cast steel	
	Huta "Zygmunt" S.A.	Steelworks at Bytom, producing crude steel, cast iron, and crude steel	

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Steel--Continued:			
Semimanufactures only	P.P. Huta im. Cedlera	Steelworks in Sosnowiec, producing hot-rolled products, cold-rolled strip, and cast iron	
	P.P. Huta "Kosciuszko"	Steelworks at Chorzow, producing hot-rolled products	
	Huta "Pokoj" S.A.	Steelworks at Ruda Slaska, producing hot-rolled products	
	Huta "Andrzej" S.A.	Steelworks at Zawadskie, producing pipes	
	Huta "Ferrum" S.A.	Steelworks in Katowice, producing pipes	
	P.P. Huta "Bobrek"	Steelworks in Bytom, producing pig iron, hot-rolled products, and cast iron	
	Huta "Buczek" S.A.	Steelworks in Sosnowiec, producing pipes and cast iron	
	P.P. Huta "1 Maja"	Steelworks in Gliwice, producing hot-rolled products	
	Zaklad Wielkopiecowy "Szczecin" Sp. z o.o.	Steelworks at Szczecin, producing pig iron	
Sulfur	P.P.Kopalne i Zaklady Przetworcze Siarki "Siarkopol"	Operations at Tarnobrzeg, mining the Jeziorko-Grebow-Wydza deposit.	5,700.
	P.P. Kopalnie i Zaklady Chemiczne Siarki "Siarkopol"	Operations at Grzybow, mining the Osiek and Grzybow-Gacki deposits.	

1/ The data presented in this table was compiled, in large measure, from information provided in the Minerals Yearbook of Poland (Bilans Gospodarki Surowcami Mineralnymi w Polsce Na Tle Gospodarki Swiatowej 1995) prepared and published by the Department of Mineral and Energy Policy, Mineral and Energy Economy Research Centre of the Academy of Sciences of Poland, The Ministry of Environmental Protection, Natural Resources and Forestry. Additionally, very valuable information and criticism was provided by Mr. Krystof Galos and other members of this academic department.